Interacting with background music engages E-Customers more: The impact of interactive music on consumer perception and behavioral intention

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ABSTRACT

The current study investigates the potential of applying interactive music to the design of e-commerce websites, aiming to create more engaging consumer experience. The model of Theory of Interactive Media Effects (TIME) is applied to propose two psychological mechanisms – heightened consumer control and perceived vividness of the website – that explain the effect of interactive music on consumer engagement. A single-factor experiment with three conditions (the control condition without background music, the static background music condition, and the interactive background music condition) was conducted and data from 248 consumers were collected. Results found that consumers in the interactive music condition were more affectively engaged in the shopping task compared to those in the other two conditions due to a higher level of novelty. The novelty dimension of affective engagement subsequently led to stronger behavioral intention and more positive perception toward the website and its brand. Whereas consumer control explained only affective engagement with the online store, perceived vividness of the website predicted both cognitive and affective engagement. In conclusion, the present study contributes to scholarship by addressing limited discussion on interactive music under the context of consumer behavior and drawing attention to perceived control and vividness as critical mediators of consumer engagement in the digital retailing environment.

1. Introduction

The online shopping market is evolving at an unprecedented pace. In 2017, global e-commerce sales amounted to 2.3 trillion US dollars and e-retail revenues are projected to double in the next five years (Hall, 2017). According to Nielsen Holdings' Nielsen, 2017 *Total Consumer Report* (2017), in the United States, the online merchandising market is expected to thrive with a growth rate of 12.2% through 2020. The business becomes ever competitive among online retailers who strive to create one-of-a-kind shopping experience. Hence, the current study attempts to integrate interactive music as an innovative media format to e-commerce environment and investigates its effects on online consumers. Interactive music refers to a category of audio media where specific actions of a user lead to alteration in various aspects of music, such as tempo, mode, texture, and volume (Winkler, 2001). Specifically, the media format raises the

interest of the present research for two main reasons. To begin with, research in non-business realms has revealed positive effects of interactive music. For instance, its use in music therapy was found to be effective in enhancing attention and task performance of children with attention deficit disorder (ADD) (Haslbeck, 2014; Schwartz et al., 2017). However, there has been little discussion on interactive music under business context, and its impact on consumer behavior remains unclear. On top of that, we see potentials of applying interactive music to online retail stores as both music and interactivity are found to increase the level of *user engagement*, which is a critical factor that yields greater e-consumer perception and behavioral intention.

In online retailing, music has traditionally been considered as an important atmospheric component that can create more vivid shopping environment and more hedonic consumer experience (Cuny et al., 2015). The presence, tempo, volume, dynamics, and atmospheric ef-

fects of background music provide rich peripheral cues and generate an increased level of perceived vividness, leading consumers to be more affectively engaged while shopping online (Xu and Sundar, 2014; Papagiannidis et al., 2017). Former literature has suggested that a heightened level of consumer engagement contributes to greater emotional reactions, brand perceptions, and even purchase behavior (Morrison et al., 2011; Andersson et al., 2012; Xu and Sundar, 2014). As a result, integrating appealing background music into online shopping has been considered as a profitable application of experiential marketing in e-commerce channels. Abundant studies have also examined how music could influence customers through two main approaches: (1) how background music functioned as a peripheral cue and influenced consumers' affect by creating a pleasant shopping environment (e.g. Floh and Madlberger, 2013; Morin et al., 2007), and (2) how the manipulation of various musical components (e.g. tempo, tune, and texture) produced distinct ambient effects (e.g. Ding and Lin, 2012; Biswas et al., 2018). However, despite the emergence of interactive techniques in user interface design, the application of interactive music has not been commonly seen in digital storefronts, which initiated our interests to conduct comprehensive discussion on the joint use of interactivity and musical stimuli.

Likewise, interactivity has been found to increase both affective and cognitive engagement of online shoppers, encouraging behavioral intention and positive perception of online shoppers (Cano et al., 2017; Xu and Sundar, 2014; O'Brien, 2010). Besides the sole presence of background music, the proliferation of on-screen interaction techniques indicates new possibilities for how music can be presented on retailing websites. While interactivity is now an essential part of web design in online retailing (Pandey and Chawla, 2018), there has been little attempt to examine how interactivity and background music can be combined to induce greater consumer experience. Website interactivity provides users the technical capability to interact with an interface and to modify its content in real time (Steuer, 1992; Liu and Shrum, 2009; Sundar et al., 2015). Enhancing the sense of control and the vividness of user experience, interactivity elevates user engagement and contributes to consumers' favorability toward the website (Mollen and Wilson, 2010; Oh and Sundar, 2015; Van Noort et al., 2012). Accordingly, website interactivity has been found to enhance both utilitarian and hedonic consumer values (Yoo et al., 2010) and influence product attitudes and purchase intention positively (Xu and Sundar, 2014).

As previous research shows both background music and interactivity can yield positive effects in e-commerce, a joint use of the two components may bring out even more positive effects on user engagement (Deweppe et al., 2015). Employing this idea in an e-commerce setting, the current study aims to experimentally evaluate the psychological effects of interactive background music on user engagement as well as its mediating effects on consumers' perception and behavioral intention toward a shopping website. Based on extensive literature review, we established the theoretical framework of the current study based on the Theory of Interactive Media Effects (TIME) (Sundar et al., 2015) and posit the effects of interactive music

on online consumers through two psychological pathways (i.e. the cue route and the action route). A fictitious e-commerce website was created to conduct a single factor experiment with three conditions: an interactive music condition, a static background music condition, and a control condition.

1.1. Intended contributions of the current study

The current study intends to make theoretical contributions by initiating one of the first attempts to apply interactive music under business context and parsing out its psychological effects on consumer engagement. Grounded upon the Theory of Interactive Media Effects (Sundar et al., 2015), we propose two different routes of consumer engagement by interactive music: user control (the cue route) and vividness (the action route). The two mediators (user control and vividness) draw our interests not only due to their significance in prior consumer research literature, but also their fit with the context of interactive music as an application of innovative technology in e-commerce. By combining user interface literature with consumer psychology research, we aim to set a cornerstone for future interdisciplinary studies in e-commerce.

With the joint use of interactivity and musical stimuli, the current experiment also addresses deficiency in former literature from two dimensions. First, we treat background audio beyond a mere peripheral cue and discuss its persuasive potentials from both cognitive and emotional perspectives. Second, while former user experience research stressed the importance of visual elements in interface design, we noticed there are very limited empirical studies investigating users' direct interaction with musical components in e-tailing environment. Given the criticality to understand consumers from both a cognitive and a behavioral perspective, we investigate how interactive music can influence the study subjects' purchase intention and website perceptions. The practical implications of our study will focus on suggesting guidelines for using interactive atmospheric features of online retailing websites to improve purchase intentions.

2. Theoretical background

Former literature has discussed the effects of interactive technology from various perspectives, including message interactivity, source interactivity, and modality interactivity (Yang and Shen, 2017). Table 1 summarized findings of former consumer behavior research regarding the effect of interactivity on user engagement. As demonstrated in the table, limited studies have empirically investigated how direct interaction with musical elements (e.g. tempo, timbre, mode, pitch) can impact consumers' engagement on e-tailing websites, and scholars have not come to a consensus on the operational mechanism through which interactivity intervenes user engagement. Therefore, the current literature review first identifies applicable theoretical framework to propose plausible operational pathways of interactive music and hypothesize its possible effect on digital consumers.

Table 1
Summary of former studies on the effects of interactivity on consumer engagement.

Literature	Methodology	Type(s) of interactive feature(s) discussed	Proposed operational mechanism of interactivity
Li et al. (2002)	Study 1: single-factor experiment with 2 conditions (2D vs. 3D ads) Study 2: 2 (3D vs. 2D ads) × 2 (geometric vs. material product type)	Visual components of 3D advertisements	In interactive conditions, sense of presence enhances user engagement, leading to positive impact on product knowledge, brand attitude, and purchase intention.
Yoon et al. (2008)	Large-scale survey	Interactive affordances of online customer services	Two dimensions of perceived interactivity (synchronicity and two-way communication) serves as antecedents for relationship marketing, enhancing consumers' engagement in brand relationship.
Mollen & Wilson (2010)	Literature review	On-screen interactive gestures (e.g. clicking, zooming, dragging, sliding, hovering)	Interactivity is an antecedent of telepresence, which enhances both cognitive and affective engagement of online consumers.
Xu & Sundar (2014)	3 (interactivity: low, medium, high) × 3 (arousal: control, low, high) empirical study	Visual presentation of products	Interactivity enhances consumer engagement through a heightened level of immersion, sense of fun, and control, leading to more positive attitude, purchase likelihood, and behavioral intention toward a shopping website.
Bilgihan and Bujisic (2015)	Large-scale survey	On-screen interactive gestures (e.g. clicking, zooming, dragging, sliding, hovering)	Interactivity increases utilitarian value of a website, encouraging consumers to affectively and cognitively engaged in their shopping experience, leading to positive outcomes on relationship marketing.
Erdoğmuş and Tatar (2015)	Literature review with a focus on the S-O-R model	Interactive functions of social media (e.g. liking, commenting, sharing)	Interactivity on social media can enhance cognitive and affective brand engagement, leading to greater brand trust and higher purchase intention.
Luarn et al. (2015)	Case study on social media brand pages across 10 different brands	Interactive functions of social media (e.g. liking, commenting, sharing)	A higher degree of interactivity leads to greater user engagement on brand pages, resulting in more likes, comments, and shares on brands' social media sites.
Yi et al. (2015)	Single-factor experiment with three conditions (control, low, and high interactivity)	Visual presentation of products	Interactivity creates flow experience to enhance user engagement, leading to positive impact on purchase intention.
Yoon & Youn (2016)	Large-scale survey	On-screen interactive gestures (e.g. clicking, zooming, dragging, sliding, hovering)	Active control, two-way communication, and synchronicity as mediators of perceived interactivity, which enhances consumers' brand engagement.
Fan et al. (2017)	Large-scale survey	On-screen interactive gestures (e.g. clicking, zooming, dragging, sliding, hovering)	Interactivity increase user engagement through a heightened level of control, communication, and responsiveness.
Huang and Benyoucef (2017)	Large-scale survey	On-screen interactive gestures (e.g. clicking, zooming, dragging, sliding, hovering)	Interactivity serves as a functional construct to optimize usability of e-commerce websites, leading to higher user engagement when consumers shop online.
Schultz (2017)	Case study on social media sites of brands in apparel and food retailing industry	Interactive functions of social media (e.g. liking, commenting, sharing)	Interactivity serves as an appealing characteristics of brand posts, encouraging digital engagement of consumers.
Shin et al. (2018)	Large-scale survey	On-screen interactive gestures (e.g. clicking, zooming, dragging, sliding, hovering)	Interactivity improves perceived quality of online retailing websites, which drives continued engagement of its shoppers.
Viglia et al. (2018)	Content analysis and qualitative comparative analysis	Social interaction among stakeholders' relational exchanges	Cognition played a more critical role than emotion does in stimulating stakeholder engagement.
Petit et al. (2019)	Literature review	On-screen interactive gestures (e.g. clicking, zooming, dragging, sliding, hovering)	Interactivity enhances congruency and mental representation of information on e-commerce websites, which contributes to greater engagement of consumers.

While the presence of interactive music on e-commerce websites will be a non-social and non-verbal component, it is most reasonable for the current study to view it as a medium-based affordance and discuss its effects from a modality interactivity standpoint. Therefore, the current study applies the model of Theory of Interactive Media Effects (TIME) (Sundar et al., 2015) to establish its theoretic framework, as the TIME model is not only grounded on several well-established theories in web interactivity literature (e.g. Liu and Shrum, 2002; Jensen, 1998; Newman, 1991; Sundar, 2008a; Ryan and Deci, 2000), but more importantly, the TIME model is fundamentally built on the affordance aspect of interactive technology. The TIME model is constructed with three major sections: predictors, mediating variables, and persuasive outcomes. Specifically, under the context of the present research, predictors refer to the presence and consumers' actual use of the interactive features on an e-commerce website. The next, the current study centers discussion on affective and cognitive consumer engagement and posits consumer control and vividness as its antecedents. Finally, online consumers' behavioral intention and evaluation toward the e-tailing website, its brand, and products are investigated as persuasive outcomes of interactive music. Based on the theoretical framework, the following sections elaborate on how hypotheses are developed for the current study.

2.1. Theory of interactive media effects (TIME)

User interface consists of different affordances (Gaver, 1991) such as modality and interactivity (Sundar et al., 2015) that govern the way users interact with the website. For instance, interactivity enables users to slide, scroll, click, and zoom-in, and different modalities provide users with audio and video stimuli. Rooted in dual process models in persuasion, the theory of interactive media effects (TIME, Sundar et al., 2015) was formed by four pillars (i.e. *the MAIN model*, Sundar, 2008a; *the Agency model*, Sundar, 2008b; *the Interactivity Effects model*, Sundar, 2007; *the Motivational Technology model*, Sundar et al., 2012) and integrated theoretical support across the fields of social psychology, human-computer interaction, user interface design, and more. For instance, based on Self-Determination Theory (Ryan and Deci, 2000), the Motivational Technology model proposed how technical affordances can trigger on-screen behavior (e.g. information seeking) and inferential thinking by offering users a higher sense of control and autonomy.

Specifically, TIME proposes two routes by which interface

affordances can influence consumer engagement: the cue route and the action route. The theory is grounded upon the idea that website affordances not only motivate users to make actual use of different communication features, but also offer psychologically salient cues that convey heuristic values of the website. For instance, the presence of interactive music, as a combination of interactivity and audio modality, allows users to take action on changing its tempo and melody (the action route), and simultaneously serves as a symbolic cue that implies greater user control (the cue route). The actions and cues afforded by interface features have their psychological correlates, which can influence interface and content perception as well as greater user engagement.

As one of the most up-to-date models in interactivity research, TIME has already been adopted in a wide variety of studies despite its recency. Former literature has utilized the model to better understand how consumers behaved in an immersive environment (e.g. Soler-Adillon and Sora, 2018; Javornik et al., 2016a; Javornik et al., 2016b) and how interactive media influenced human cognition and behavior (e.g. Waddell, 2018; Horning, 2017). Applying the theoretical framework, we posit that interactive music can generate an impact on user engagement and consumer behavior through both the cue route and the action route. Based on literature review, we further predict that interactive music would lead to greater perceived user control and vividness, which are two key psychological correlates that predict consumer engagement. The following sections review previous literature that further supports this proposition.

2.2. The effect of interactive music on perceived control through the cue route

Due to the multi-dimensional nature of interactivity, researchers have yet agreed on a consensual definition of interactivity (Janlert and Stolterman, 2017). One of the most common defining factors, however, is the heightened level of consumer control on the various aspects of human-computer interaction, including its medium, source, and message (e.g., Steuer, 1992; Song and Zinkhan, 2008; Sundar et al., 2015; Yoo et al., 2010). Interactivity is the extent to which an interface allows users to modify a mediated environment in real time (Steuer, 1992; Song and Zinkhan, 2008), and website interactivity can be further classified into the degree to which users are capable of accessing media content using various modes of communication (modality interactivity), creating and tailoring media content (source interactivity), and having a conversation-like interaction with the website that addresses their previous inputs (message interactivity) (Sundar et al., 2015). Applying the concept of interactivity as consumer control to background music, the current study defines interactive music as the degree to which consumers can adjust various aspects of background music, such as its melody, beat, and tempo, while shopping online.

As TIME (Sundar et al., 2015) suggested, the interactive opportunities to change background music can imbue users with greater perceived control by serving as a psychological cue. Consumers would be able to experience different options to click and choose to layer additional tracks of melody or beats to the original music while shopping online. These options would trigger a perception that consumers can customize the shopping environment based on their musical tastes, which would be correlated with a higher level of perceived control over the shopping experience. In fact, previous studies have shown that perceived control is one of the core aspects of website interactivity (Liu and Shrum, 2009; McMillan, 2002). Thus, the present study proposes:

H1. Compared to the website without background music and the website with static background music, the website with interactive music will enhance the perception of consumer control.

2.3. The effect of interactive music on vividness through the action route

Another psychological outcome of employing interactive music on shopping websites is an increase in perceived vividness of the website. Vividness refers to the richness of a mediated environment and the way the environment presents and communicates sensory information (Steuer, 1992). Since the 1990s, neuroengineering technology has allowed researchers to investigate the effect of music on perception and cognition (Zatorre et al., 1996). Upon perceiving musical stimuli, the brain transmits and produces mental representation in ones' mind, which leads to a heightened extent of perceived vividness (Schaefer et al., 2011; Clark and Williamon, 2012). Regardless of the format and context of music, studies have confirmed the effect of music-listening on enhancing imagery ability (Clark and Williamon, 2012).

In addition, interactivity is able to enhance individuals' perceived vividness through the enhancement of media richness (Oh and Sundar, 2015). Though a wide range of attributes can contribute to a greater extent of vividness, they can be generalized into two dimensions: sensory breadth and depth, which concerns the diversity of perception channels and the quality of media content (Steuer, 1992; Hopkins et al., 2004). Considering the cross-modality nature of interactive music, sensory breadth provides a hypothetic explanation to why interactive music can elicit a greater extent of perceived vividness and lead to its positive impact on communication outcomes than static background music does.

Consistent with these previous studies, TIME (Sundar et al., 2015) also proposes the same outcome for interactive music. Interactive websites that provide different modalities address multiple senses, which increases individuals' perceptual bandwidth. One of the major indicators of the increased perceptual bandwidth is vividness – as their sensory channels are widely activated, they would be more likely to perceive the website as vivid. Prior studies have replicated that interactive websites that involve multiple sensory channels such as motor reaction and audio/visual stimuli evoked greater vividness of website content, which yielded greater favorability from its audience (e.g. Coyle and Thorson, 2001; Fortin and Dholakia, 2005; Papagiannidis et al., 2017). Considering that interactive music appeals to motor, visual, and audio perceptions, the present study anticipates interactive music to create rich, vivid experiences for online consumers. Therefore, we propose:

H2. Compared to the website without background music and the website with static background music, the website with interactive music will further enhance perceived vividness of the website.

2.4. The effects of user engagement on consumer attitudes and behaviors

User engagement commonly refers to a state where users are cognitively or emotionally involved in a task at hand (e.g., Busselle and Bilandzic, 2008; O'Brien and Toms, 2008; O'Brien et al., 2018; Oh et al., 2018). Per former business literature (e.g.Viglia et al., 2018; Mollen and Wilson, 2010; Brodie et al., 2013), consumer engagement includes both psychological and functional dimensions, and when individuals are engaged with an interface, they perform passive compliance and/or active interaction with its content. User engagement has been defined in many ways, but most literature came to the consensus that there are at least two different components in defining the concept: cognitive and affective (e.g., O'Brien and Toms, 2008; Oh et al., 2018; Viglia et al., 2018). On one hand, affective engagement is tied to "the emotional investment a user makes in order to be immersed in an environment" (Jennings, 2000, p. 78). In O'Brien and Toms (2008)'s conceptual framework, emotional engagement can be elicited through aesthetics, novelty, interests, hedonic motivation or experiential goals. On the other hand, cognitive absorption and elaboration construct the two

pillars of cognitive engagement (Oh and Sundar, 2015; Sundar et al., 2015). Whereas cognitive absorption is defined as the state where an individual is "consciously involved in an interaction with a complete attentional focus in the activity" (Oh and Sundar, 2015, p. 215), elaboration is a process in which individuals integrate relevant information and experience to evaluate a topic (Green and Brock, 2000; Slater and Rouner, 2002). In sum, users are regarded as being "engaged" when they are affectively immersed in consuming mediated content (Agarwal and Karahanna, 2000), and/or when they invest their cognitive resources using their previous experience and knowledge to make judgments (Ravindran et al., 2005).

User engagement serves as the key mediator to drive positive effects on online consumer behavior and brand perceptions. Under an e-commerce context, consumers were found to display more positive attitudinal or behavioral responses toward a highly interactive retailing website, due to the heightened user engagement (O'Brien, 2010; Sundar et al., 2015; Cano et al., 2017). In the same vein, Mollen and Wilson (2010) suggest an increased level user engagement on an e-commerce website contributes to online consumers' active commitment to a personified brand. Bowden (2009) also found that affective engagement is a transitional pathway to a higher scale of customer satisfaction, leading to a greater extent of trust, delight, and loyalty. Besides, scholars also agree that cognitive engagement commonly leads to behavioral commitment, such as learning, sharing and advocating a brand and its products (Brodie et al., 2013; Hollebeek et al., 2014). Thus, the present study proposes.

H3. Compared to the website without background music and the website with static background music, the website with interactive music will positively influence online consumers' behavioral intention (H3a), likelihood of recommendation (H3b), website perception (H3c) and attitude (H3d), brand value (H3e), and retail preference (H3f), by increasing consumer engagement.

2.5. Perceived control and vividness as mechanisms of consumer engagement

Previous literature has provided two theoretical pathways to explain how interactive music could increase the extent of user engagement in shopping tasks (O'Brien & Toms, 2008; Xu and Sundar, 2014; Schwartz et al., 2017). First, the Theory of Excitation Transfer Effect posits that rich perceptual cues increase the level of excitation, which amplifies an individual's physiological response and cognitive appraisal (Cantor et al., 1974). Under the current context of interactive music, when audio stimuli trigger excitation, the transfer effect enhances a consumer's emotional reactions and cognitive processing in an online shopping platform (Xu and Sundar, 2014; Jeong et al., 2011; Mollen and Wilson, 2010). The mechanism can create a heightened level of engagement with the media content, and more positive attitude and behavioral intention toward the mediated environment (Xu and Sundar, 2014; O'Brien & Toms, 2008). However, this theory would not be able to fully address how different user actions involved in interactive media bring out greater user engagement.

Second, as reviewed above, the Theory of Interactive Media Effects (Sundar et al., 2015) suggests that perceived control and vividness would significantly mediate the effect of interactive music on consumer engagement. Different modes of communication in an interactive interface, such as clicking, scrolling, dragging, and hovering, can enrich the affordance of an online platform. Former studies have found these interactive features can enhance consumer engagement by facilitating users to be more attentive and immersed with a task at hands (Cano et al., 2017; Oh and Sundar, 2015; Xu and Sundar, 2014) by expanding one's sensory breadth and depth involved in the interaction process (Sundar et al., 2010). However, none of the studies above formally examined the mediating role of perceived vividness in driving user engagement. Similarly, previous studies in the field of music therapy found that interactive music could improve user engagement and task performance by enhancing one's attention (Haslbeck, 2014; Schwartz et al., 2017). In addition, Webster and Weir (2005) also confirmed that interacting with a variation of musical elements (e.g. mode, texture, and tempo) significantly affected individuals' emotional reactions. Again, these studies have not yet confirmed what psychological correlates of interactive music could lead to these positive outcomes.

In the current study, we propose perceived control and vividness as key mechanisms of consumer engagement based on the following rationales. First, studies have reported that perceived control can positively impact users' attitudes and their behavioral intentions on an interactive web interface (Xu and Sundar, 2014; Sundar et al., 2014). When users are aware of their capability to modify the medium and its content, they pay more attention and enjoying browsing and navigating on the website more, which contributes to the audience's cognitive and affective engagement respectively (Sundar et al., 2015; Oh and Sundar, 2015). Furthermore, according to the Process Model of User Engagement, users' attention and interest must be continuously presented for them to stay "engaged", which again emphasizes the critical role of perceived control in evoking greater consumer engagement (O'Brien and Toms, 2008; O'Brien et al., 2018).

Second, previous literature also suggested that vivid media content contains a greater number of perceptual cues which facilitate individuals to build cognitive and emotional connections with the interface (Coyle and Thorson, 2001; Papagiannidis et al., 2017). Vivid interfaces are claimed to strengthen the interaction with its users through one or both of the following pathways. The first, vivid interfaces are generally more attractive to users, and it captures users to consume media content by generating positive emotions, such as fun, playfulness, and excitement; the second, while vividness contributes to unique experiences, users can easily recognize, memorize, and recall content on a vivid interface, which facilitates them to process and attend to information on the website (Coyle and Thorson, 2001; Demangeot and Broderick, 2006; Oh and Sundar, 2015).

In summary, literature in both music (Schaefer et al., 2011; Belfi et al., 2016) and interactivity (Beuckels and Hudders, 2016; Coyle and Thorson, 2001; Liu and Shrum, 2009; Oh and Sundar, 2015; Sundar et al., 2015) posits that perceived control and vividness as key mediating variables can lead to a greater extent of consumer engagement. Synthesizing the literature reviews above, we propose:

H4. Perceived consumer control (H4a) and vividness (H4b) will significantly mediate the effects of interactive music on consumer engagement.

2.6. Summary of hypotheses

In sum, the present study posits that interactive music can positively impact consumers' perceptual responses through enhancing perceived consumer control and vividness. As a result, interactive music will have a significant effect on consumer engagement that leads to a greater behavioral intention and more positive evaluation toward the website and its brand compared to the use of static background music. Fig. 1 summarizes our hypotheses.
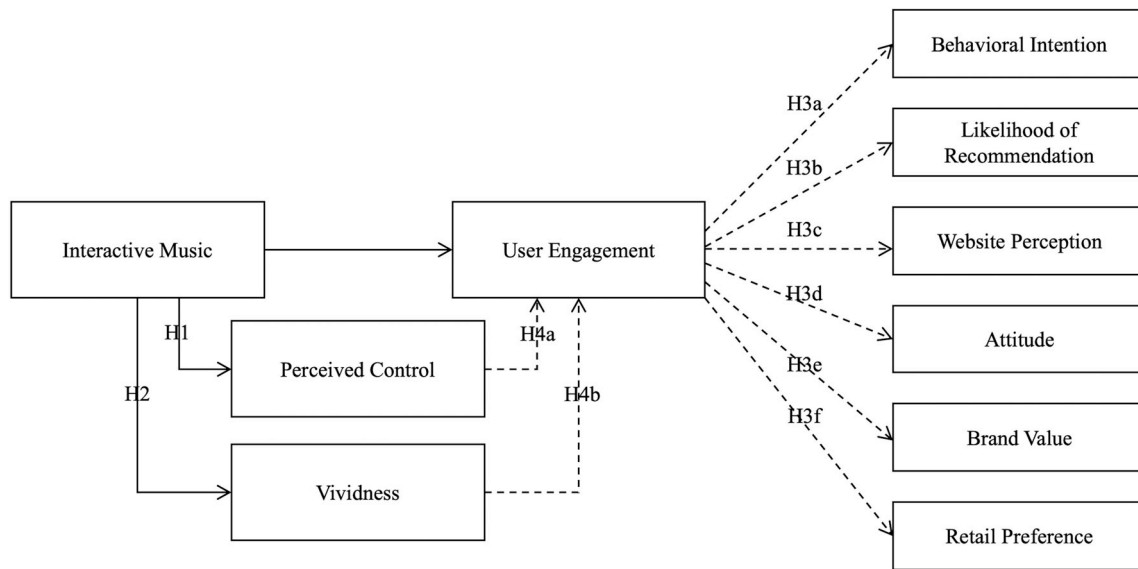
Fig. 1. The theoretical framework of the present study. Solid lines indicate direct effects and dashed lines indicate mediating effects.

3. Method

3.1. Research design

The study created an e-commerce website (Fig. 2) and manipulated a common technique of interactive music, soundtrack layering, which refers to layering additional tracks of melody to the original music (Winkler, 2001). A single-factor experiment with three conditions was conducted: a control condition without background music, a static background music condition, and an interactive music condition.

While participants encountered the same visual content in all three conditions, in the condition with interactive background music, users could initiate or cease various soundtrack layering effects by clicking on any button on the product catalog page (Fig. 3a) and each individual product page (Fig. 3b). That is, the interactive feature can be initiated through any of the following scenarios: (1) when one clicked on a product on the catalog page to land an individual product page, (2) when one clicked on a filtering button on the catalog page, (3) when one clicked on a "quick view" button on the catalog page, and (4) when one clicked on any button on an individual product page. When any of the four scenarios took place, a track of beats or melody would be randomly added to or removed from the background, which also prevented participants from fatigue and continued to offer the sense of fun and unexpectedness of an interactive experience. For clarification, there is no specialized button on that initiate interactive music, but the interactive feature is simply integrated in the shopping experience and is streamlined with users' click actions. In contrast, in the static background music condition, there was no change in the audio regardless of one's clicking.

Both the interactive condition and the static condition used the same background music. That is, participants neither had the option to select what type of music they would prefer to listen to nor could they turn off the background music during the experiment – the only difference was whether consumers could create any sound effect by layering additional beats and melody to the music. Similarly, participants did not decide which additional soundtrack to layer, as the interactive feature was initiated and aligned with their click actions while they shopped through the stimulus website. A piece of jazz music was used to construct the stimulus website, and it consisted of three soundtrack layers: a track of cello melody as a base, a track of drum beats, and a track of horn melody. In the interactive music condition, once participants performed click actions in the above four scenarios, the three tracks were presented or muted on a random basis. In the static background music condition, the full piece of jazz music (starting with the cello base, added with the drum beats, then followed with the layer of horn melody) was played regardless of participants' click actions. As respondents were required to shop on the stimulus website for at least 3 min, it was guaranteed that they would listen to all three layers of soundtracks. Therefore, the richness of music per se should be of the same degree between the interactive and the static background music condition. In the control condition, there was no music playing in the background at all.

3.2. Stimulus and manipulation

Three versions of the same website with a fictitious brand name, *aboutleather.com*, were constructed for this study. All of them shared four tabs (i.e. "Home", "About us", "Shop", and "Contact us") and the same page content and layout where a menu bar, a shopping cart icon, and a "Check out" button were displayed on the top of each page. During the study, participants were directed to land on the "Shop" page (i.e. the product catalog page as shown in Fig. 3a), containing eleven fictitious leather products. The price for leather products ranged from $20.00 to $85.00. Two filtering panels were presented on the side bar, and participants could view the product catalog by three categories (i.e. "New," "Leather bags," "Footwears," and "Accessories") and six available colors (i.e. brown, green, gray, blue, yellow, and red). By clicking on each product image, participants were directed to a corresponding product information page. The layout of all product pages was identical, which included a product image, an interactive panel, and a purchase panel. In the interactive panel, when a user clicks on one of the six buttons (i.e. "View more pic", "Story", "Product details", "Shipping info", "Return & refund", and "Questions?"), a text-box with certain product information was displayed.

Under the interactive music condition, additional beats or melody were layered on the original soundtrack when users clicked any button

about leather

Home   About us   Shop   Contact us   🛒⁰   Check out

filter by category

leather bags

accessories

footwear

asymmetry leather key case
$35.00
quick view

mini leather card holder
$29.00
quick view

square head leather shoes
$85.00
quick view

filter by color

🟧 🟩 ⬜
🟦 🟨 🟥

filter by category

below $30.00

$30.00 - 60.00

$60.00 - 100.00

sale

minimalist leather backpack
$78.00
quick view

leather shopper tote
$35.00
quick view

cross-body shoulder bag
$60.00
quick view

mini bucket bag
$69.00
quick view

original leather book cover
$20.00
quick view

leather charger roll-up
$25.00
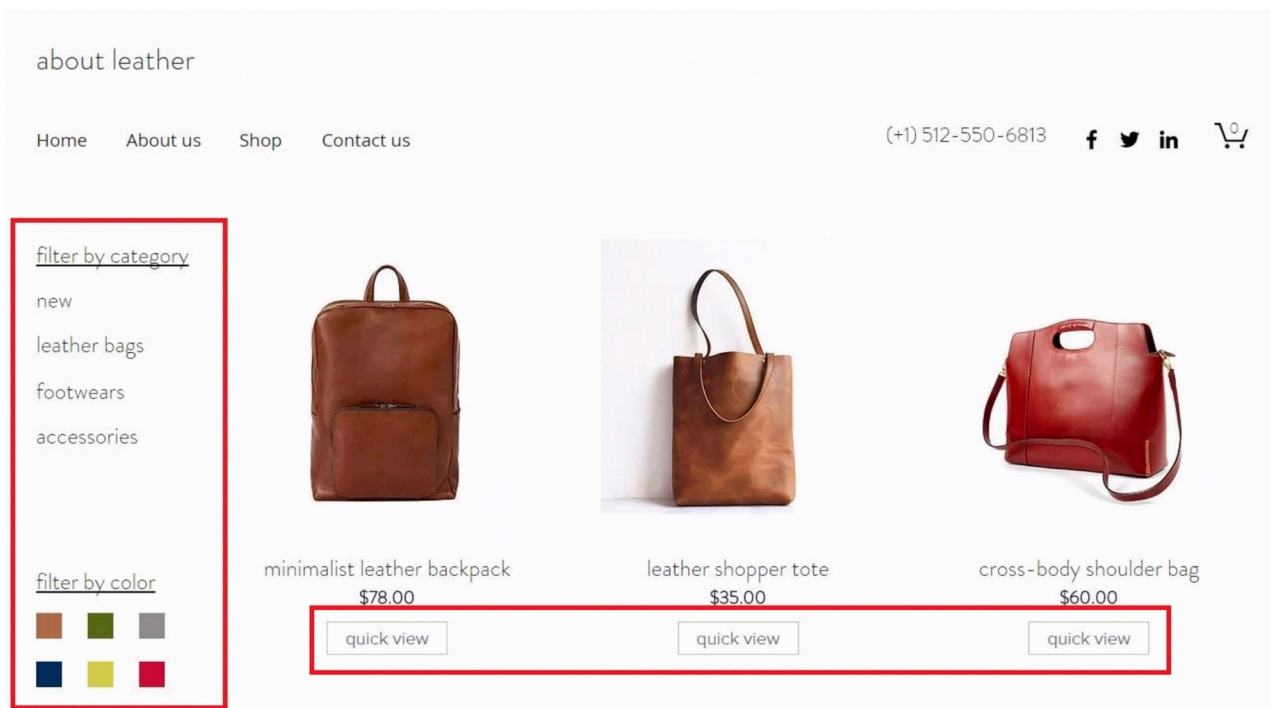quick view

Fig. 2. A screenshot of the stimulus website.

Fig. 3a. A screenshot of the "Shop" page of the stimulus website. Highlighted buttons and filtering panels could initiate interactive music.
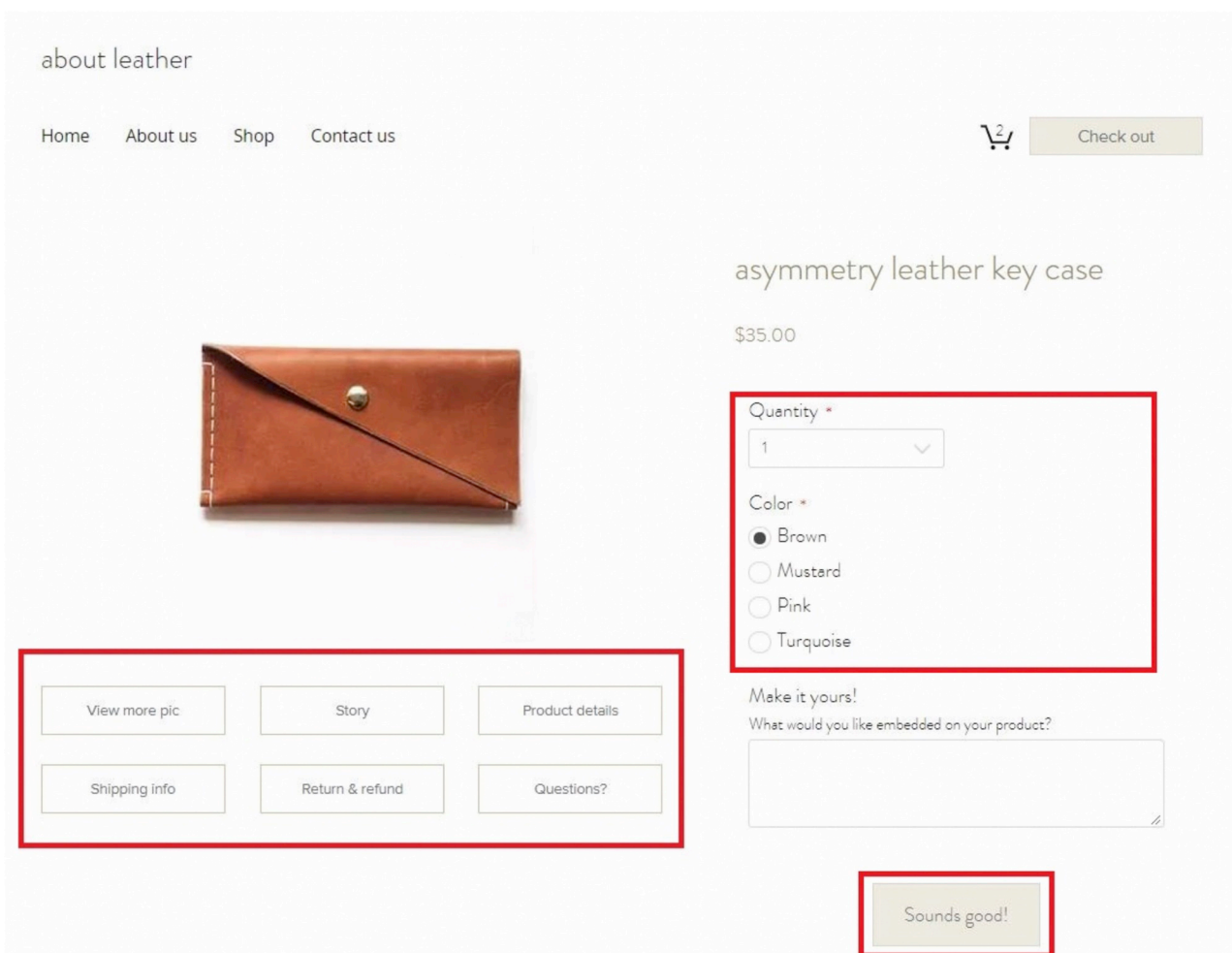

Fig. 3b. A screenshot of an individual product page of the stimulus website. Highlighted panels could initiate interactive music.

on the "Shop" page or each individual product page. To ensure participants were aware of the function to interact with background music on the stimulus website, a pop-up message was displayed once they landed on the "Shop" page to introduce the interactive feature. As mentioned above, the background music played automatically once participants entered the stimulus website and the interactive music feature can be elicited through any of the four scenarios. For instance, after a participant landed the "Shop" page, s/he could first interact with the music through applying the filtering functions on the side bar to view the product catalog by price range or by category or by color. Following, when s/he clicked to view certain product, an additional layer of beats or melody would be blended with the original soundtrack when s/he entered the product page. The next, when the participant clicked on any button on either the interactive panel or the purchase panel, the interactive music feature would once again be initiated. The was no specific button that controlled the background music, and the interactive function was integrated with participants' shopping experience. As they clicked through the website, this act could either (1) initiate another layering effect (i.e. adding another piece of beats or melody to the background) or (2) restore the music to its original soundtrack. Either of the two outcomes took place on a random basis. Whether participants had former exposure to the media format would not hinder them from experiencing interactive music on the stimulus websites, as no manual inputs were required to initiate the interactive features. Under the static background music condition, there was no change to the background music regardless of participants' click actions. The background music automatically started when participants entered the stimulus website. Under the control condition, there was no music playing in the background.

In the interactive and static music conditions, the same piece of G-major jazz music with 95 beats per minute was presented, and participants were not able to choose what they would listen to in the background. The particular piece of jazz music was chosen for two reasons. The first, former studies have stressed the importance of congruity when applying background music to a shopping environment (Jain and Bagdare, 2011; Oakes and North, 2008). Therefore, to resonate the relaxing ambience of the stimulus website, jazz music was considered as the most suitable among main music genres. In addition, the piece of music was composed with major mode and regular tempo (90–102 beats per minute). These specific musical elements have been found to yield the greatest effect in promoting users' involvement (Schwartz et al., 2017). In addition, under the interactive music and static music conditions, the background music would automatically start to play once participants entered the stimulus website, and they were not able to turn off the background music nor dysfunction the interactive feature.

Considering that website interactivity should provide users with a perception that they are able to modify the mediated content in real time (Steuer, 1992; Yoo et al., 2010; Sundar et al., 2015), participants were informed of an ability to make a change in the background music in the interactive music condition. In the interactive music condition, a pop-up box was displayed when users first entered the website, saying "You can make a change in the background music by clicking on any button on the site". As participants click through web pages, they were able to initiate soundtrack layering effects, which responded to their clicking. In the static music condition, participants listened to the same music, but the background music did not change upon clicking.

3.3. Participants and procedure

319 undergraduate students from a large public university in the U.S. were recruited for the online experiment via a subject pool for course credit. Prior to browsing the shopping website, participants filled out a pre-questionnaire which measured their Internet usage and music consumption behaviors. Then they were instructed to complete a shopping task by placing at least three items in their online shopping cart and spending at least 3 min on the e-commerce website. Participants were randomly assigned to one of the three conditions. Particularly, those in the interactive and static music conditions were instructed to turn on the volume on their devices before browsing. After fulfilling the shopping task, participants were asked to complete a post-questionnaire which included manipulation checks and measurements of mediating and dependent variables. After filtering out participants who did not make any click on the shopping website or failed to listen to the background music as well as data of extreme values,[1] 97 participants' data were recorded under the control condition, 75 data under the static music condition, and 76 data under the interactive music condition. 51 males and 197 females were included in the final dataset. The average age was 20.31 years old, and the majority were Caucasian (51.12%), followed by Hispanic (25.81%), and Asian (16.13%).

3.4. Measurement

All self-reported items were measured by a 7-point Likert scale unless specified otherwise. The pre-questionnaire included questions that measured the frequency of listening to music, their preference of music genres, and use of musical instruments (Lee and Downie, 2004). Demographics and online shopping habits were also measured to analyze the moderating effects of selected antecedents. Later, the post-questionnaire included a manipulation check and measurements of mediating and dependent variables.

3.4.1. Individual differences (control variables)

The pre-questionnaire asked participants about their Internet use behaviors, music-listening and -playing behavior as well as their existing online shopping habits. Respondents reported *the number of hours of Internet use per day* ($M = 7.93$, min = 2, max = 20, $SD = 3.51$) and *purposes of Internet usage* (Table 2) as well as their *comfortability with navigating on the first visit to a website* ($M = 6.03$, $SD = 1.02$) (Chen, 2015). None of these three variables varied across the three conditions. Secondly, participants were asked the following four questions from Lee and Downie (2004) regarding their music-listening and –playing behavior: (1) whether they are professionals in the field of music or related areas ($M = 0.04$, $SD = 0.19$, where 1 being "Yes" and 0 being "No"), (2) whether they play a musical instrument regularly ($M = 0.63$, $SD = 1.43$), (3) the number of hours they listen to music daily ($M = 4.46$, min = 0, max = 20, $SD = 3.30$), and (4) their preference toward the eight major music genres (i.e. jazz, blues, hip-hop, rock, pop, classical, country, and electronic) (Table 3). The third, the pre-questionnaire asked participants to report their current online shopping habits, including their *online shopping frequency* (Table 4), *purchase amount in dollars* for the past three months (Table 5), and their level of *involvement* in online shopping. Specifically, the Personal Involvement Scale by Zaichkowsky (1985) was adapted, and five bipolar scales (unimportant – important, irrelevant – relevant, means nothing – means a lot, of no concern – of much concern, not needed – needed) assessed the extent to which a respondent involves in online shopping ($M = 5.21$, $SD = 1.13$, Cronbach's α = 0.91). None of these variables varied across the three conditions. Demographic questions, including gender, age, and ethnicity were also presented in the questionnaire (Table 6). None of the demographic variables were varied across three conditions.

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[1] The questionnaire collected data of participants' Internet usage and music listening behavior (Please refer to Section 3.4.1. for more information). Three participants who reported they spend 24 h every day listening to music and surfing the Internet were considered as extreme values and were excluded from data analysis.

Table 2
Frequency table of respondents' Internet usage purposes.

Purposes of Internet Usage	Mean	Std. Deviation	F-Value
Professional purposes	5.51	1.23	.45
Communication	5.56	1.25	.03
Gaming	2.02	1.40	.36
Online shopping	4.38	1.48	1.02
Information seeking	5.47	1.26	1.49
Entertainment	5.40	1.34	.38

Table 3
Frequency table of respondents' preference toward the eight major music genres.

Music Genre	Mean	Std. Deviation	F-Value
Jazz	1.85	1.13	1.14
Blues	1.70	1.10	1.03
Hip-hop	4.26	1.66	.71
Rock	3.29	1.69	.10
Pop	4.67	1.47	.43
Classical	2.08	1.31	1.26
Country	2.67	1.77	.83
Electronic	2.92	1.73	1.47

Table 4
Respondents' online shopping frequency for the past three months.

Music Genre	Count	Percentage of Total (%)
Fewer or Never	7	2.82%
Once every two months	27	10.89%
Once a month	50	20.16%
Once every two weeks	84	33.87%
Once every week	39	15.73%
More than once every week	41	16.53%

Table 5
Respondents' purchase amount in dollars for the past three months.

Music Genre	Count	Percentage of Total (%)
$0	10	4.03%
Less than $100	78	31.45%
$100 - 200	70	28.23%
$200 - 300	48	19.35%
$300 - 400	16	6.45%
$400 - 500	8	3.23%
More than $500	18	7.26%

Table 6
Frequency table of respondents' demographics.

Demographics	Mean	Std. Deviation	F-Value
Gender	1.79	0.41	.52
Age	20.31	1.65	1.75
Ethnics	2.95	1.02	.46

3.4.2. Mediators

Manipulation check (perceived control). The current study defines interactive music as the degree to which users can control various aspects of background music such as its melody, beat, and tempo while shopping online. Thus, perceived control was measured by six items to check whether the interactive condition induced the greatest perception of consumer control among the three conditions. First, three items adapted from Sundar et al. (2015) asked participants to indicate how interactive the website was, and to what degree they perceived a sense of control and freedom while accessing information on the website. In addition, three more items were created to ask if the user noticed any difference in the background music when they clicked on buttons in the interactive panel on a product page to initiate changes in the background music. The six items consisted of a reliable measure of perceived control ($M = 4.87$, $SD = 1.05$, Cronbach's $\alpha = 0.95$).

Vividness. Vividness was measured by three items from Sheng and Joginapelly (2012), which adopted Steuer's scale (1992) and was revised to accommodate a web interactivity context. Specifically, the list of questions asked (1) whether the website offered rich media content, (2) whether the website stimulated the respondent's sense, and (3) whether the website was vivid, ($M = 4.10$, $SD = 1.43$, Cronbach's $\alpha = 0.90$).

Affective engagement. Affective engagement was measured by three attributes: affect, enjoyment, and novelty, selected from O'Brien and Toms' model of engagement (2008). *Affect* measured respondents' emotional states through five bipolar scales (sad – happy, bad mood – good mood, irritable – pleased, depressed – cheerful, annoyed – content) ($M = 4.68$, $SD = 1.10$, Cronbach's $\alpha = 0.92$). *Enjoyment* was measured by the six items (entertaining, enjoyable, interesting, fun, exciting, and appealing) ($M = 3.82$, $SD = 1.50$, Cronbach's $\alpha = 0.97$). Measured through four items, *novelty* evaluated the extent to which users found the shopping experience to be unexpected, novel, beyond expectation, and that the website applied a new technique that respondents had not seen on other websites ($M = 3.71$, $SD = 1.28$, Cronbach's $\alpha = 0.88$).

Cognitive engagement. Cognitive engagement was measured through the extent of absorption and elaboration performed during participants' shopping tasks (Oh and Sundar, 2015). The first, cognitive *absorption* was assessed using five items adopted from O'Brien and Toms' model and modified to accommodate the online shopping context (2008), which asked participants whether they spent more time than intended and whether they were able to block out external distractions to measure the level of immersion while they shopped on the stimulus sites ($M = 4.13$, $SD = 1.29$, Cronbach's $\alpha = 0.92$). The second, six items of *elaboration* were also measured to investigate the extent to which respondents engaged in reflective thinking toward information obtained from the stimulus website in order to (1) evaluate product features, (2) decide actions taken on the website, (3) make connections between the product information and prior consumer knowledge, (4) make comparisons among multiple products, (5) compare the brand with other brands, and (6) relate the products with prior user experiences ($M = 4.59$, $SD = 1.14$, Cronbach's $\alpha = 0.85$) (O'Brien and Toms, 2008).

3.4.3. Dependent variables

Behavioral intention. Two aspects of behavioral intention were taken into concern in the study. The first, *purchase intention* asked respondents' intention in purchases on both needed and voluntary basis, trial purchases, and purchases to learn more about a new brand ($M = 3.79$, $SD = 1.44$, Cronbach's $\alpha = 0.93$) (Putrevu and Lord, 1994). The next, two items adopted from Baker and Crompton (2000), which respectively measured (1) willingness to visit the brand's online store regardless of an increase in product prices and (2) willingness to pay higher price for products of the brand than for those of other brands, were utilized to investigate participants' *willingness to pay more* ($M = 2.84$, $SD = 1.45$, Cronbach's $\alpha = 0.89$).

Likelihood of recommendation. Adopted from Coyle and Thorson's scale (2001), the section measured whether participants were likely to recommend the online shopping site, the brand, and its products to acquaintances on a voluntary basis and under an ad hoc circumstance (i.e. when they were asked for referral of an online shopping site by others) ($M = 4.12$, $SD = 1.56$, Cronbach's $\alpha = 0.91$).

Website perception. Per previous literature, particular adjectives were selected from Russell's (1980) and Circumplex Model of Emotion to measure respondents' evaluation web features on the site which they encountered (Boltz et al., 2009). Participants were asked to evaluate web features (e.g. background music if any, shopping options, website design, shopping flow, etc.) on the stimulus websites through four positive-active adjectives (exciting, delightful, pleasing, and passionate) and four

positive-passive adjectives (calm, relaxing, serene, and comforting) on a seven-point Likert scale, where 1 being extremely negative and 7 being extremely positive ($M = 4.67$, $SD = 1.10$, Cronbach's $\alpha = 0.95$).

Attitude. The section includes measurements on the brand level and assessments specific to the online shopping website. First, five items measured participants' overall brand attitude on bipolar scales, including good – bad, positive – negative, valuable – worthless, necessary – unnecessary ($M = 4.34$, $SD = 1.12$, Cronbach's $\alpha = 0.94$) (Spears and Singh, 2004). Second, four items evaluated respondents' attitude toward the website to understand (1) whether the site facilitates the brand and its products to build a relationship with its users, (2) participants' attitude toward functions provided on the website, (3) whether participants felt comfortable surfing the website, and (4) how they would rank the website compared to other online shopping channels ($M = 4.38$, $SD = 1.21$, Cronbach's $\alpha = 0.82$) (Elliot and Speck, 2005).

Brand value. Adopted from Brakus, Schmitt and Zarantonello's Exploratory Factor Analysis on Brand Experience (2009), brand value was assessed through eleven items from affective, intellectual, and behavioral dimensions ($M = 3.61$, $SD = 1.32$, Cronbach's $\alpha = 0.95$). For affective brand value, the survey asked whether the brand could elicit sentimental effects on its customers, such as "the brand induced feelings and sentiments". For intellectual brand value, the measures assessed the extent to which respondents were encouraged by the brand to apply critical thinking in his/her shopping experiences, such as "I engaged in a lot of thinking when I encountered this brand". For behavioral brand value, participated were recorded with their actual actions triggered by the brand and its online store, such as "I engaged in physical actions and behaviors when shopping on the website".

Retail preference. The attribute measured whether respondents considered the brand with excellence and whether they posited relative positive attitude toward the stimulus brand and its products, in comparison to that of other options he/she had when shopping online. Per previous literature, four items (e.g. "When it comes to shopping for leather goods, the brand is among my top choices,") were measured to investigate participants' post-stimulus retail preference ($M = 3.85$, $SD = 1.38$, Cronbach's $\alpha = 0.91$) (Mathwick et al., 2001).

4. Results

One-way analysis of variance (ANOVA) was used to examine the effects of manipulation on perceived control (H1) and vividness (H2). Model 4 of the PROCESS macro developed by Hayes (2013) was used to identify the indirect effects of interactive music on behavioral intention, website perception, and brand value through consumer engagement (H3), and the indirect effect of interactive music on consumer engagement through perceived control and vividness (H4). As former literature did not suggest co-existence nor a sequential relationship between the two variables, we selected Model 4 in order to evaluate the mediators (i.e. perceived control and vividness) one by one (Hayes, 2017). For all data analysis, several variables were controlled to eliminate confounding effect of individual differences, including participants' Internet usage (i.e. the number of hours spent online every day), music listening frequency, preference toward jazz music, online shopping frequency, purchase amount, and the level of involvement. In addition, while female participants consisted the majority of the current sample, gender was also incorporated as a control variable for all data analysis.

4.1. Perceived control (H1)

One-way ANOVA showed that the three conditions differed significantly from each other in their levels of perceived control, $F(6, 241) = 28.44$, $p < .001$. A post-hoc test using Tukey-Kramer HSD method indicated that the interactive music condition ($M = 4.33$, $SE = 0.15$) led to the highest level of perceived control, followed by the condition with static background music ($M = 3.40$, $SE = 0.15$) and the

control condition ($M = 2.83$, $SE = 0.13$), $p < .001$.

4.2. Vividness (H2)

One-way ANOVA test revealed the significant main effect of interactive music on perceived vividness, $F(6, 241) = 6.42$, $p < .01$. The Tukey-Kramer HSD test showed that the interactive music condition led to the highest level of perceived vividness (interactive music: $M = 4.55$, $SE = 0.16$; static background music: $M = 4.04$, $SE = 0.16$; control condition: $M = 3.78$, $SE = 0.14$). In contrast, the level of perceived vividness reported in the static background music condition was not significantly different from that in the control condition.

4.3. The mediating effects of consumer engagement (H3)

Though the extent of cognitive engagement was not directly varied by the three conditions, one-way ANOVA tests revealed a significant difference among the three conditions in the extent of affective engagement, particularly in the novelty dimension, $F(6, 241) = 3.72$, $p < .05$, while there is no significant difference in the other attributes of affective and cognitive engagement. According to a Tukey post-hoc test, the interactive music condition resulted in the highest level of perceived novelty of the website ($M = 4.03$, $SE = 0.15$), followed by the static background music condition ($M = 3.69$, $SE = 0.15$) and the control condition ($M = 3.47$, $SE = 0.13$), $p < .05$. However, there is no significant difference in novelty between the static background music condition and the control condition. Additionally, with the use of interactive music, Model 4 of the PROCESS macro verified the significant indirect effect through novelty on behavioral intention (purchase intention: $B = 0.38$, $SE = 0.13$, 95% C.I. from 0.12 to 0.64; willingness to pay more: $B = 0.33$, $SE = 0.12$, 95% C.I. from 0.10 to 0.58), likelihood of recommendation ($B = 0.35$, $SE = 0.13$, 95% C.I. from 0.12 to 0.62), website perception ($B = 0.26$, $SE = 0.10$, 95% C.I. from 0.08 to 0.47), attitude (brand attitude: $B = 0.32$, $SE = 0.12$, 95% C.I. from 0.10 to 0.55; attitude toward the website: $B = 0.23$, $SE = 0.09$, 95% C.I. from 0.06 to 0.42), brand value ($B = 0.39$, $SE = 0.14$, 95% C.I. from 0.12 to 0.65), and retail preference ($B = 0.36$, $SE = 0.13$, 95% C.I. from 0.11 to 0.60).

4.4. The mediating effects of perceived control and vividness (H4)

Model 4 of the PROCESS Macro assessed whether interactive music demonstrated mediating effects on increasing cognitive and affective engagement through a heightened level of perceived control, arousal, and vividness. Again, cognitive engagement was investigated through two dimensions (absorption and elaboration) and affective engagement was discussed through three attributes (affect, enjoyment, and novelty). First, data showed perceived control showed no mediating effects in enhancing cognitive engagement (absorption: $B = 0.14$, $SE = 0.11$, 95% C.I. from -0.07 to 0.35; elaboration: $B = 0.12$, $SE = 0.09$, 95% C.I. from -0.03 to 0.30) but did significantly enhance affective engagement especially in the dimensions of enjoyment and novelty (affect: $B = 0.11$, $SE = 0.08$, 95% C.I. from -0.05 to 0.27; enjoyment: $B = 0.24$, $SE = 0.11$, 95% C.I. from 0.02 to 0.47; novelty: $B = 0.19$, $SE = 0.10$, 95% C.I. from 0.01 to 0.39). Secondly, perceived vividness had significant mediating effects on both cognitive and affective engagement. Whereas consumer control mediated the effect of interactive music on only the two specific dimensions of affective engagement (i.e., enjoyment and novelty), perceived vividness successfully mediated all different dimensions of cognitive engagement (absorption: $B = 0.34$, $SE = 0.10$, 95% C.I. from 0.15 to 0.56; elaboration: $B = 0.20$, $SE = 0.07$, 95% C.I. from 0.08 to 0.35) and affective engagement (affect: $B = 0.30$, $SE = 0.09$, 95% C.I. from 0.14 to 0.48; enjoyment: $B = 0.54$, $SE = 0.15$, 95% C.I. from 0.25 to 0.83; novelty: $B = 0.46$, $SE = 0.13$, 95% C.I. from 0.21 to 0.72). Together, the effects of consumer control and vividness on the communication outcomes of interactive music are summarized in Fig. 4.
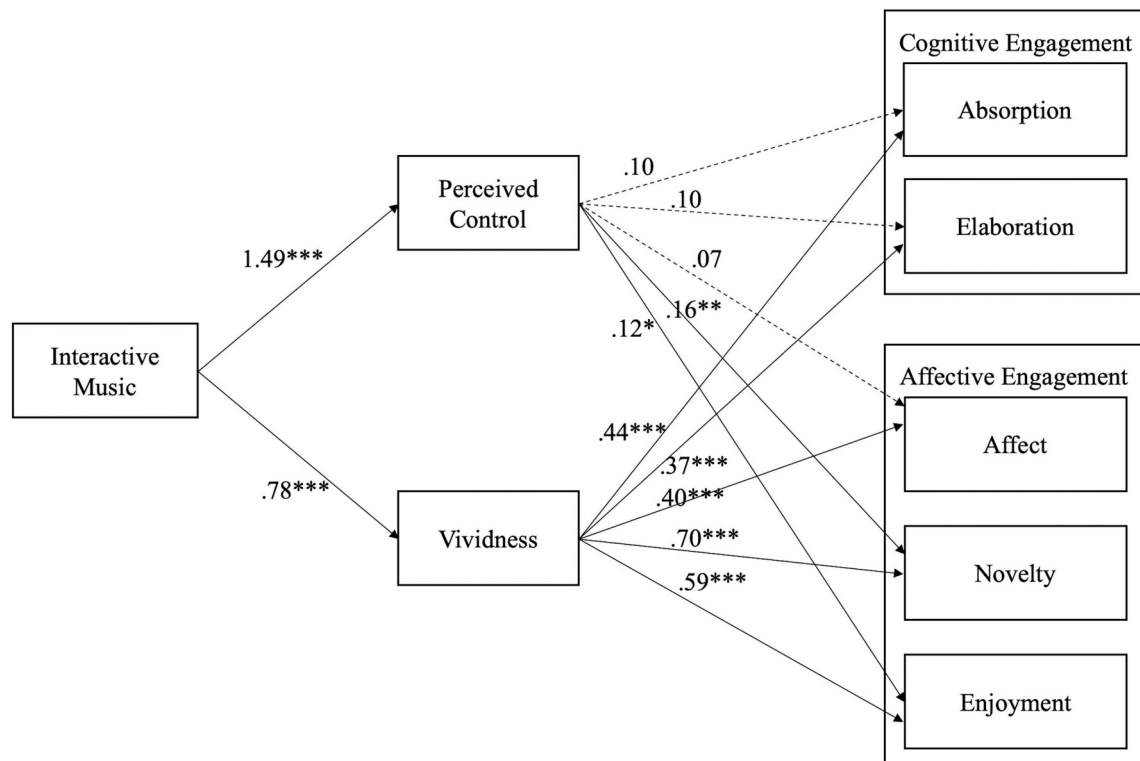
Fig. 4. Summary of mediating effects of perceived control and vividness on cognitive and affective engagement. *$p < .05$, **$p < .01$, ***$p < .001$. Solid lines are significant.

4.5. Summary

Empirical outcomes of the present study verified all four hypotheses in the proposed theoretical framework. To begin with, manipulation checks and one-way ANOVAs found that interactive music led to greater consumer control and perceived vividness than the other two conditions; therefore, H1 and H2 are verified. Second, one-way ANOVA demonstrated the highest level of affective engagement under the interactive music condition. Furthermore, follow-up bootstrapping analyses reported the significant mediating effects of consumer engagement (the novelty dimension) on behavioral intention (H3a), recommendation (H3b), web perception (H3c), attitude (H3d), behavioral intention (H3e), and retail preference (H3f). Finally, mediation analyses also supported H4, as interactive music was shown to increase affective and/or cognitive engagement through greater consumer control (H4a) and perceived vividness (H4b).

5. Discussion

5.1. Theoretical implications

This study analyzed the psychological mechanisms by which interactive music can enhance persuasion in the e-commerce setting. The Theory of Interactive Media Effects (Sundar et al., 2015) served as a framework of the study that explained two different mechanisms of user engagement: perceived control (the cue route) and vividness (the action route). Results verified their mediating effects on consumer engagement, lending general support to the theory. Interactive music created a perceptually richer interface than static background music did, which was significantly associated with both cognitive and affective engagement. It also enhanced perceived control, which was predictive of novelty and enjoyment dimensions of affective engagement.

Whereas perceived control was a primary predictor of affective engagement only, vividness successfully predicted both cognitive and affective engagement. This finding lends support to the fundamental difference between the cue and action routes proposed by TIME. Whereas the cue route explains consumers' heuristic processing of media interface, the action route reflects greater cognitive processing of the website's information. Our data demonstrated this by showing that perceived control was positively associated with the retail website's face value such as its novelty and enjoyable shopping experience, whereas vividness was associated with deeper consideration of brand and product features. Applying TIME to a marketing context, our results apply user interface literature to explain the appeal of interactive retail websites and provide scientific evidence on why it is important to involve users to change the atmosphere of their shopping experience.

In addition to the indirect effects through perceived vividness and control, the direct effect of interactive music was also essential to producing a higher perception of novelty, an important attribute of consumer engagement (O'Brien et al., 2018). The shopping website that allowed consumers to change its background music was perceived to be more novel, unexpected, and original. More importantly, the novelty aspect of interactive music was a significant predictor for all outcome variables in our study. Resonating with the Theory of Excitation Transfer Effects (Cantor et al., 1974) and the Process Model of User Engagement (O'Brien and Toms, 2008), interactive music created rich and stimulating e-commerce environment, which was translated into more positive evaluation toward the brand and higher behavioral intention to purchase.

Findings of the current study not only explain the operational mechanism of interactive music but also provide insights for both marketing and human-computer interaction literature. While individuals interact with the aesthetic aspect of their e-commerce experience, the shopping interface offers a control heuristic such that users can customize their shopping experience, as well as perceptually more vivid experience. These positive perceptions lead to greater affective and cognitive engagement for consumers. Accordingly, the heightened level of consumer engagement enhances their brand attitudes and behavioral intentions, when all the other aspects of the website remained the same across three conditions.

Scholars have long debated whether the positive effects of interactivity on innovative interfaces assume an optimal degree of interactivity; that is, whether an interface can be "too interactive," and thus its excessive extent of stimulus results in negative user evaluation (Bucy, 2003; Fortin and Dholakia, 2005; Yang and Shen, 2017). For instance, Rozendaal et al. (2007) posited that the attractiveness of vivid interfaces follows an invert U-shape. Therefore, a medium level of vividness encourages users to be more engaged with the content, but when a medium increasingly stimulates a higher level of arousal, users can face challenges to focus on performing tasks in the Web environment. In response to the concern, the current study provides experimental evidence to suggest that interactive music, despite generating multi-sensory stimuli that involve both auditory and mouse-based interactions, can produce positive effects on consumer engagement. Simultaneously increasing perceived control and vividness, interactive music creates an effective liaison between the utilitarian and hedonic values on user experiences, which leads consumers to be more engaged with a website on both cognitive and affective dimensions.

Regarding the impact of interactive music on consumer engagement, findings of its meditating effects on cognitive absorption and elaboration draw particular attention to its persuasive potential. Based on the Elaboration Likelihood Model (Petty and Cacioppo, 1986), musical stimuli are commonly regarded as peripheral cues which influence individuals when they perform tasks with a low level of involvement (Morrison et al., 2011; Andersson et al., 2012). Nonetheless, current experimental results suggest that musical stimuli, with a joint use of interactive features, can serve beyond creating a pleasant atmosphere. In this study, vividness of the website driven by interactive music was capable of predicting not only participants' affective engagement but also cognitive engagement, across the three conditions that were not significantly different in their music preferences. Thus, the effects of interactive music on cognitive processing also imply that the website feature can be applied to a wider variety of online retail stores, including both high and low involvement product types.

The incorporation of various control variables in the experiment and data analysis also generated importance theoretical implications. First of all, while former literature has emphasized existing shopping habits as critical antecedents to empirical study on online consumer behavior, findings of the current research were yielded while controlling for participants' online shopping frequency, purchase dollar amount, and the level of involvement. Besides, participants' music preference and their music learning behavior were also taken into account as control variables. As a result, findings of the current study verified the universal impact of musical stimuli, or more generally, aesthetics in interface design, on consumer behavioral intention and perceptions. This not only implies the generalizability of current research but also suggests its potential to apply interactive music to other merchandising settings and for other persuasive purposes.

5.2. Practical implications

The present study possesses both praises and concerns toward the findings regarding the effect of interactive music on the novelty aspect of affective engagement. On one hand, our findings suggest that interactive music holds the potential to create one-of-a-kind consumer experiences, which will yield unique proposition value to a brand and its products. For online marketing, marketers can specifically target consumers who are more attentive to the experiential values of online shopping with the application of interactive music on brand websites, as the group of individuals favor and constantly seek for innovative and unexpected shopping experiences (Mathwick et al., 2001). On the other hand, participants in the present experiment were university students. These digital-native consumers generally display a higher degree of technology savviness and favorability toward unexperienced interface features, in comparison to their elder counterparts (Akçayır et al., 2016). Future research ought to attempt to obtain greater external

validity of findings by investigating the positive effects of interactive music across different age groups.

5.3. Limitations

There are several apparent limitations that should be acknowledged in the present research. To begin with, though the stimulus website was designed to simulate an online retail store, participants were still aware of its fictitious nature. As a result, participants could pay less attention to features such as product price and quality during the shopping task, causing possible discrepancy between the participants' purchase intention and real-world shopping scenarios. Whereas the psychological mechanism of interactive music could be rigorously tested by our randomized experiment, future research will benefit from field studies conducted in a more natural shopping environment and would provide richer understanding of actual consumer behaviors.

Secondly, the experiment was conducted online, not in a lab environment, which could lead to strengths and weaknesses of the empirical study. On one hand, participants were able to perform the shopping task at their own convenience with their own electronic devices, which could be more in line with their online shopping setting in real life; on the other hand, though we were able to filter out participants who did not follow instructions and those who did not turn on their volume, we had no control over their use of hardware devices to a granular level. For instance, we were not certain whether participants put on headsets or applied their computers' audio when they listened to the background music, which, per former research (Biswas et al., 2018), could moderate the effect of musical stimuli. Last but not least, while subjects of the current study were recruited from a university's participant pool, the extent of demographic diversity could be lower than market average (Cleveland et al., 2011); particularly, there is an apparent limitation in age range and the highest educational degree.

5.4. Directions for future research

Some limitations of the current study can be addressed by future research. The current study measured consumers' perceptual and behavioral intention under a constructed shopping task. Future research utilizing field studies to investigate consumer behavior can be valuable assets to both theoretical and practical discussion on the application of interactive music to e-commerce. For instance, using click data to track the actual product views as well as time spent on each webpage will allow future researchers to better understand the interaction between consumers and an interface with interactive music. Additionally, more accurate measures for purchase intention can be applied, as the dollar amount placed for orders can be stronger indicators than self-reported behavioral intention. On top of that, lunching the study to a larger sample of the general public can both ameliorate the current study's limitation in demographic and cultural diversity as mentioned in the previous section and ensure a higher potential to generalize the effect of interactive music beyond its controlled setting. Even though we have controlled for many individual variables related to their preference and involvement of jazz music and online shopping, future studies can further investigate how different cultural background or cultural tastes can moderate the effect of interactive music in e-commerce.

Furthermore, given that the current study reveals the capability of interactive music in enriching online consumer experiences, one major direction for future research is to examine if the effects of interactive music differ on experiential- and functional-oriented consumers. While audio stimuli serve as hedonic cues in e-commerce environment (Andersson et al., 2012), interactive features can enhance both technical affordances and playfulness of a virtual retailing store (Xu and Sundar, 2014). Therefore, whether experiential- and functional-oriented consumers perceived the value of interactive music through distinct aspects, leading to different impact on their perception and behavior, deserves future studies to reveal further insights.

6. Conclusion

Extending on previous findings in human-computer interaction and marketing literature, we proposed and examined an innovative interface feature, interactive music, which enables consumers to create a soundtrack layering effect while shopping online. Established on the groundwork of the TIME model (Sundar et al., 2015), the current study proposed and evaluated two mediators (i.e. perceived vividness and consumer control) to explain the effectiveness of interactive music on e-consumer behavior. Findings of the current research suggested both theoretical and practical importance and provided an asset to the linkage between interface design and consumer psychology. Theory-wise, the current study explicated two aspects of consumer engagement (i.e., cognitive and affective) and applied a model of interactive media to explain two different mechanisms by which interactive background music can influence consumer perceptions and behaviors in e-commerce. Findings not only supported the TIME model but also extended its implication by demonstrating the different effects of user control and vividness on user engagement. From a practical perspective, findings of the experiment supported the profitable potential for applying interactive music to an e-commerce environment, as the liaison of perceived vividness and sense of control can bring musical stimuli beyond emotional heuristics and encourage both inferential thinking and brand engagement. Regarding how interactive music can attain consumer engagement, perception, and behavioral intention, the current study emphasizes the critical role of novelty in emerging technology and its application in virtual merchandising interface design.

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